APPLICATION

FOR

UNITED STATES LETTERS PATENT

TITLE: Audio Scrubbing

INVENTORS: Keith Salvucci

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AUDIO SCRUBBING

Background

[0001]   The invention relates generally to video editing software, and more

particularly to a graphical user interface for video editing software. Historically editing

of video images has been limited to professional production companies using extremely

expensive equipment. This was in part because the significant computational power

necessary to perform editing of video images has been prohibitively expensive for the

consumer market. Because the market for video editing equipment, *e.g.*, video editing

software, has been comprised almost entirely of professionals, it has historically been

very feature rich, but also encumbered with correspondingly sophisticated user

interfaces.

[0002]   Recently, innovations in computing power of personal computers has

combined with reduced costs for such systems and availability of consumer-grade

digital video cameras to put professional-grade video editing within the capability of

consumer-oriented personal computers and relatively inexpensive hardware/software

combinations. Although the computational power necessary to perform video editing

has been made available to the consumer, the historic problems with excessive user

interface complexity has prevented wide-spread adoption of video editing hardware and

software for the personal computer targeted at the consumer market. Thus, it would

be beneficial to provide video editing software and/or a video editing software hardware

combination with a greatly simplified user interface to enable a typical consumer to produce professional-grade video using inexpensive, general-purpose computers.

Summary

[0003] The present invention relates to a graphical user interface. More particularly, the present invention relates to a graphical user interface for media file editing software designed to be used on a general purpose computer. The interface provides improved features for locating a point of interest with in the media file based on an audible portion of the file.

[0004] In particular, a graphical user interface provides a scrubber bar, which iconographically illustrates a time axis of the media file. The graphical user interface further comprises a play head indicating a current temporal location of the media being displayed and/or audibly broadcast at that point in the media file. By clicking and dragging a playhead along a scrubber bar, the user may hear an accelerated playback of the audio portion of the media file. The speed of the playback preferably varies as a function of the displacement between the playhead and cursor, *i.e.*, the rate at which the playhead is dragged along the scrubber bar.

Brief Description of the Drawings

[0005] Figure 1a illustrates creation of an audio/video media file.

[0006] Figure 1b illustrates the transfer of an audio/video media file to a personal computer.

[0007] Figure 2A illustrates a graphical user interface for a media file editing program in accordance with the teachings of the present disclosure.

[0008] Figure 2B illustrates an enlarged view of a portion of the user interface of Fig. 2A.

Detailed Description

[0009] A graphical user interface to a video editing software program for use on a general purpose personal computer is described herein. The following embodiments of the invention, described in terms applications compatible with computer systems manufactured by Apple Computer, Inc. of Cupertino, California, are illustrative only and should not be considered limiting in any respect. Additionally, while the invention is described with regard to a video editing, it is applicable to any type of media editing, including video files, audio files, and audio-video files. As used herein, the term media should be understood to include each of these types of files and their equivalents.

[0010] With reference to Fig. 1A, a user 101 uses a video camera 102 to record video images of a scene 103. Video camera 102 may be any type of video camera, although it is preferably a consumer-oriented video camera and more preferably a consumer-oriented video camera that records images in a digital format. Subsequently, as indicated in Fig. 1B, user 101 connects the video camera 102 to a personal computer 104 for the purpose of transferring the recorded video images from the video camera to the personal computer. Personal computer 104 is preferably one of various types manufactured by Apple Computer, Inc., although the graphical user interface described

herein may be used with other computer types. If video camera 102 is a type that records images in a digital format, and it is equipped with an output port compatible with an input port on the computer, *e.g.*, IEEE 1394 a/k/a "Firewire", the video data may be transferred to the computer exactly as recorded. Alternatively, if video camera 102 records images in one of various traditional analog formats, *e.g.*, VHS or its derivatives, personal computer 104 may be equipped with some sort of video capture device, for example a video capture peripheral card, that will capture the video data from the camera and store it on the computer in a digital format suitable for further processing by the computer. Various techniques and devices for transferring video images from a video camera to a computer are known to those skilled in the art, and it is contemplated that any of them may be used in accordance with the system described herein.

[0011] Once loaded on the personal computer, recorded video may be edited, stored on the computers hard disk drive, or copied to another medium for storage or for replay on another device. Media to which the video may be copied include, for example, digital versatile disk (DVD) or video compact disk (VCD or SVCD). Additionally, combinations are also contemplated, *e.g.*, the video may be edited on the personal computer and the edited video may then be copied to a DVD for storage and replay on another device.

[0012] Turning now to Fig. 2, a screen shot from video editing software in accordance with the present invention is illustrated. Main window 200 comprises the visual portion of the user interface to the video editing software. As typically found in

computer systems having graphical user interfaces, window control "buttons" 202 allow

the user to maximize, minimize, or close main window 200. A composition window or

monitor 204 is used to view the current video composition, *i.e.*, the product of the video

editing process. A scrubber bar 205 allows the user to move through a clip or

composition, either frame by frame or on a faster basis. Such operation is preferably

accomplished by a "click-and-drag" operation. Playhead 206 indicates the location of

the currently displayed image within the composition, both by its relative left-to-right

position on the scrubber bar 205 and by the numerical time readout 207 located

adjacent the playhead.

[0013]   A video composition is comprised of video clips, which would be shown in

individual windows 208. Although the clip windows 208 in Fig. 2A are shown empty, for

convenience, video clips will also be referred to using reference 208. A video clip is a

sequence of video (and corresponding audio) data, for example, a sequence transferred

from the video camera. A composition may include from one to any number of

individual video clips, although typically the composition will include multiple clips.

Video clips 208 may be combined sequentially to form the composition by placing them

in the desired order in timeline 210 (Fig. 2B), which may preferably be accomplished by

a "drag and drop" operation. As indicated in Fig. 2B, the current video composition

comprises video clips 212, 214, 216, and 218, as well as additional unnumbered clips.

Figure 2B is an enlarged view of region 209 shown in Figure 2A. The timeline also

includes an audio region 211, which displays in graphical form the audio content of a

clip displayed in the timeline.

[0014]   Returning now to the scrubber bar 205 and playhead 206, in normal operation, one can move temporally within a composition by moving playhead 206 along scrubber bar 205, which is preferably accomplished by a click-and-drag operation. Scurbber bar 205 represents a time axis of the media file or composition. Once a location along scrubber bar 205 (*i.e.,* a time within the media file) is selected, the composition may be played from that location, with the video image displayed in monitor 204 and the audio portion played back through a computer's speakers (not shown).

[0015]   Typically, prior art scrubber bars have been designed so that as the playhead is dragged along the scrubber bar (by a click and drag operation using a mouse, for example), video frames corresponding to the current playhead location in the composition would be displayed in the monitor window. This has allowed a user to locate a particular image of interest in the media file. However, what has not heretofore been possible is to locate a sound of interest within the media file by using the scrubber bar. Prior art systems have not included audio playback to correspond to the user's action of dragging the playhead through the scrubber bar.

[0016]   Audio scrubbing is a feature that allows a user to easily and accurately find editing locations within a media composition aurally. To select the alternative audio scrubbing mode, a user may, for example, hold an option key, click the mouse button while the cursor is positioned in proximity to playhead 220 (Fig. 2B), which is located in the timeline overlay, and drag right or left to commence audio scrubbing. Dragging right causes forward audio playback. Alternatively, this function could be

implemented using playhead 206 in scrubber bar 205. Dragging to the left causes

reverse audio playback. This action is also preferably accompanied by the display of

images corresponding to the playhead location. Thus both the audio and video portions

of the media file corresponding to the current playhead location are played back.

[0017] Playback speed is preferably varied during the audio scrubbing operation.

In a preferred embodiment, playback speed changes based on displacement of the

cursor position from the playhead along the scrubber bar. The farther the mouse is

moved, the farther the cursor will move from the playhead location, and the faster the

playback speed is. Similarly, in reverse, the farther a user drags the mouse backwards

(relative to the time axis), the farther the cursor will move from the playhead location,

and the faster playback occurs in a reversed direction.

[0018] When a user drags the mouse (in either direction) and variable speed

playback begins, the cursor and playhead are temporarily in two different locations.

This difference in location is used to calculate the scrubbing playback speed. Initially,

the playhead lags behind the new cursor location. The difference in location gets

smaller over time because playback causes the playhead to move towards the cursor

position. As the difference gets smaller, the speed slows in proportion to the distance

between the cursor and playhead. Thus a user can easy locate a particular sound of

interest and narrow down its location by slowly moving the playhead back and forth

until the desired point is found.

[0019] If a user keeps moving the mouse, the playhead will track these

movements with a lag. The speed will always be in proportion to the difference in

positions. Eventually, if the cursor remains still, the playhead can catch up and cosite

with the cursor. As cositing occurs, the speed of playback is slowed to a stop. When

the desired location is found, the user lets the mouse button up, and audio scrubbing is

ended. The playhead is now located at the position of interest and various editing

operations can be performed starting at this location.

[0020] As to the speed at which playback occurs, it has been found through

empirical testing that the playback speed should be clamped at +/-2x the normal

speed, regardless of how far the cursor is displaced from the playhead.

[0021] While the invention has been disclosed with respect to a limited number of

embodiments, numerous modifications and variations will be appreciated by those

skilled in the art. It is intended that all such variations and modifications fall with in the

scope of the following claims.